THE ECONOMIC BENEFITS OF PRE-SCHOOL IN SOUTH CAROLINA

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··· SUMMARY ···

Pre-school is a good investment for children. Research shows that high-quality pre-school helps children's cognitive growth and enhances their future prospects. The effects are especially strong for minority children from disadvantaged circumstances.

Taxpayers also benefit from pre-school. Educational expenditures on special education, grade retention, and remediation during the K–12 years are lower. Tax revenues are higher; government expenditures on crime, health, and welfare are lower.

However, high quality pre-school for all children requires adequate resources. Many states do not allocate sufficient funds to ensure all children may benefit and to guarantee high quality programs. This report gives a cost-benefit analysis of expanding pre-school for South Carolina.

Current spending on pre-school in South Carolina is $97 million. A high quality program to cover all at-risk four-year old children in the state would cost an additional $172 million annually. This would provide 11,500 new places and upgrade existing provision for children in 4K and the Child Development Education Pilot Program.

The benefits of this pre-school investment to taxpayers—in the form of higher government revenues and lower spending—would be substantial. Conservatively, these benefits would total $326 million. They exclude the private benefits to the children and to the local community.

Therefore, the benefits exceed the costs by $154 million. For every $1 invested the taxpayer gains $1.90 in benefits. This economic calculation suggests that expanding pre-school would make very good sense for the state.

In part, pre-school is beneficial because it promotes school readiness and raises the probability of graduating from high school. On average, high school graduation significantly improves economic well-being. This is the motivation for the Education and Economic Development Act (EEDA) of 2005 and its 'Pathways to Success' model in high school and college.

EEDA programs that raise the graduation rate will generate a very high return for the state. Over the lifetime each new high school graduate in South Carolina will earn $346,000 more than a dropout. For the state's taxpayers, the economic gains per new high school graduate are $213,000 (via higher tax revenues and lower spending on health, crime, and welfare). These amounts easily exceed the per-student costs of implementing the EEDA.

These investments in education are particularly important for minority children. Research shows that these children benefit the most from pre-school. Also, these children are most at-risk in adulthood, mainly because of their higher reliance on public assistance and, for males, their involvement in the criminal justice system.

1. INTRODUCTION

Pre-school is a good investment for children. A large amount of research shows that high-quality pre-school helps children's cognitive growth. Pre-school also enhances children's futures, leading to higher graduation rates and college enrollment and these in turn lead to greater opportunities in the labor market. Although pre-school helps all children, it appears to be especially beneficial for minority children from disadvantaged circumstances.[1]

Taxpayers and the local community also benefit from pre-school investments. Taxpayers benefit through higher tax revenues and lower spending on public assistance programs, on crime, and on health. The local community benefits through enhanced economic growth and safer and more prosperous neighborhoods. Business groups—such as the Committee for Economic Development—now recognize the importance of early education as an engine for economic growth.

However, not all children have access to pre-school. There are differences by income, by race, and by locality.[2] Importantly, state policies will determine who gets access to pre-school, what quality programs are available, and what the economic benefits are. Many states are now expanding pre-school options, with some states already offering universal programs. Our focus here is on the economics of expanding pre-school for children in South Carolina.

Using economic models and new empirical evidence we quantify the economic benefits from investments in high-quality pre-school across South Carolina. We calculate these benefits from the perspective of the taxpayer and the state (as well as some selected counties). In addition, we consider the economic potential of the new Education and Economic Development Act.

This analysis begins with a description of the current opportunities for South Carolina's children to enroll in early education programs, including information on total state funding. Next, we outline options for significantly expanding pre-school options but also maintaining high quality. These new policies are then evaluated to determine the likely economic consequences. Estimates of what such a policy would cost and of the potential fiscal benefits are calculated. To determine likely returns, the analysis employs state-level and national data sources, as well as evidence from highly regarded research studies. Finally, to establish whether more pre-school investment would better serve the state over the long term, the costs and benefits of the expanded program are compared.

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1 For a review, see Gormley (2007a). See also Belfield et al. (2006); Reynolds et al. (2002); Hawkins et al. (2005); Campbell and Ramey (1994); and Magnuson et al. (2007). For evaluations of state programs, see Henry et al. (2003; Gormley et al. (2004; Barnett et al. (2005; Gilliam and Zigler (2004). For lifetime effects, see Reynolds et al. (2004).

2 On socioeconomic status differences, see: Bainbridge et al. (2005); Magnuson et al. (2005). On participation differences, see: Liang et al. (2000).

We might expect significant benefits from investments in early education for South Carolina, particularly for minority and disadvantaged children. Relative to the national average, South Carolina has high rates of low birth weight babies, infant mortality, and child deaths. The rate of teenage pregnancy is higher than the national rate and the high school dropout rate is one of the highest in the nation. Family circumstances for children in South Carolina should also be considered: one-third of children are growing up in families where no parent has full-time employment; over one-fifth are growing up in poverty; and almost two-fifths are growing up in single-parent families. All of these rates for South Carolina are above the national average.[3]

Critically, minority children—particularly African American children—face educational conditions that are far from ideal. Across the U.S., almost 60% of all African American children are reading at 'below basic' in fourth grade (the figure for whites is 36%). In math, 70% of African American children are 'below basic' in 12th grade. Other educational metrics show a similarly strong disadvantage: 23% of black males repeat a grade, 25% have been suspended, and 7% expelled; these rates are almost double the national rates. Yet, evidence on motivations and family expectations shows that African American families value education and want to succeed just as much as white families. Although improvements in education cannot fully compensate for income differences or differences in family circumstances, they represent an important way to enhance the opportunities for future cohorts of minority children.[4]

Neighboring states have successfully expanded their pre-school programs. Since the 1990s, Georgia has had a mixed public and private program funded by lottery revenues. It now offers pre-school for all children on a voluntary basis and has been demonstrated positive impacts on child development.[5] North Carolina's More at Four program has grown slowly since 2001, but it is relatively generously funded.[6]

In fact, a recent research study has shown that children in South Carolina do benefit academically from pre-school: they have higher literacy and vocabulary scores.[7] Therefore, it is important to investigate whether additional investments in early education in South Carolina generate an economic pay-off.

2. PRE-SCHOOL IN SOUTH CAROLINA

2.1 Current pre-school opportunities

In 2006–07, there were 57,251 four-year olds in South Carolina. Only a minority have access to publicly-funded pre-school. The largest program, 4K, served 20,570 children,

3 Data from Kids Count, www.aecf.org.
4 KewalRamini et al. (2007); Pouncy (2006).
5 Henry and Gordon (2006); Henry et al. (2003).
6 NIEER (2006).
7 Lamy et al. (2005).

just over one-third of all children. Places are allocated based on free and reduced-price lunch status. In addition, 6,100 children were in Head Start centers, which are federally funded, and 1,900 were receiving separate pre-school special education. However, only slightly more than half of the children (11,108) were in 4K for the full-day; the remainder (9,462) were enrolled for a half-day programs. South Carolina also supports a Child Development Education Pilot Program (CDEPP). In 2006–07, this program offered places to 3,241 children, with 90% of places supported through the Department of Education and the remainder through the Office of First Steps in private centers.

However, 53% of children in South Carolina are eligible for free or reduced-price lunch and an extra 11% are Medicaid eligible. Therefore, current provision does not fully cover all children from disadvantaged backgrounds and who might benefit most from pre-school.

Pre-school opportunities are even more constrained when we account for the amounts being spent. State funding is only for half-day programs, with the remainder of the day funded from alternative sources (such as the First Steps to School Readiness program). For full-day programs, the estimated programmatic spending per child is $4,100; for half-day programs it is $2,100 per child. Annually, total programmatic spending is approximately $57 million. Programmatic spending does not cover all costs (e.g. transportation, capital construction, or start-up costs) and so a more accurate estimate of spending is closer to $5,300 (full-day) or $2,700 (half-day), with total expenditures of $79 million. For CDEPP, total funding was $12.92 million or just below $4,000 per child. Head Start spending is an additional $39 million and the ABC child care vouchers are an additional $8 million.

These amounts of funding are almost certainly sub-optimal. As noted by SC EOC (2007) enrollment in CDEPP was considerably below budgetary allocation: this may be explained by the low reimbursement rate, particularly for new private providers that do not already have facilities. By comparison, North Carolina spends over double the amount per child through its More at Four program. In fact, the National Institute for Early Education Research ranks South Carolina as one of the states that spends the least per enrollee of all states that offer pre-school programs.

Despite some pre-school programs, many four year olds in South Carolina currently have no access to pre-school from either state or federal programs such as Head Start. Those that do enroll are either in half-day programs or in classrooms with limited resources. Yet, not only are the majority of four year olds are classified as disadvantaged but many more are likely to experience some poverty over their childhood. Very few three-year olds are enrolled also, even though the benefits of early education are found for this age group too. Consequently, South Carolina is missing an opportunity to intervene early in children's development to prevent later problems and reduce future public expenditures. In order to take full advantage of the economic benefits of pre-school, a range of expanded options across the state should be considered.

2.2 Expanding and enhancing pre-school across the state

A range of options for expanding and enhancing the existing pre-school program in South Carolina are possible. Pre-school policies vary from state to state: some are limited only at-risk children and others are universal; some are well-resourced, others are not fully funded by public revenues; and some allow private centers to operate, whereas others are restricted only to the public school system. The goal here is not to set down precisely the type of pre-schooling that should be implemented in South Carolina. Instead, it is to analyze the costs and benefits of a specific policy proposal.

The primary proposal is to significantly expand pre-school availability across the state for all four-year olds and to ensure that all places—existing and new—are in high quality centers. The program would run a full-day but be voluntary for families.[8]

It is important that pre-school programs are high-quality so that the full set of benefits is generated. Broadly, there is an agreed set of features associated with a high quality program. Specifically, pre-school is most effective when: (i) the programs are full day and full year; (ii) teachers have appropriate credentials (e.g., a BA degree), receive regular professional development, and are paid market wages; (iii) group sizes are small, i.e., less than 20 children with a teacher and aide; (iv) provision is coherent, i.e., aligned with kindergarten and not 'blended'; (v) programs are accredited; and (vi) when government monitoring is imposed and centers fully comply with standards.[9] The last of these is especially important: oversight and accountability are key to program effectiveness. The proposal here assumes that each of these features is included in the program. Indeed, these quality requirements are embodied in the CDEPP and set down in SC EOC (2006 and 2007, pA-1-3).

Of course, high quality programs should involve parents and families. There is a wealth of evidence that parents and families are the most important influence on children's developments. There is also evidence that parental involvement programs in the early years make a difference.[10] It is therefore important for pre-school programs to motivate families to support their children's education. Indeed, there is some evidence that pre-school does this: as families see their children progress, they have more incentive to support them and make sure they succeed in school.

Beyond these six features, there is considerable flexibility as to how pre-school systems may be structured.[11] Governance and administration should be managed through the state Early Childhood Education agency and the Department of Education, along with cooperation and collaboration from other organizations such as First Steps, the Head Start Offices, and the Department of Social Services. Public or private programs may be appropriate.

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8 Expansion of pre-school to three-year olds may also be an option.

9 Burchinal et al. (2000); Early et al. (2006); Robin et al. (2006); Helburn et al. (2002); Marshall et al. (2002); Loeb et al. (2004).

10 Senechal (2006).

11 See the discussion in Fuller et al. (2006).

Clearly, this proposal would require many extra spaces for the new enrollees. Some children are already enrolled in 4K or CDEPP; other families will choose not to enroll. Based on the experiences in other states, it is likely that total enrollment could reach 70%. This percentage is generally regarded as 'universal' and would cover all of the 60% of children who are either classed as free or reduced-price lunch eligible or Medicaid eligible (with an allowance for children who only intermittently become eligible). It would be feasible particularly if the state engaged in outreach activities so that families were aware of the program. This would entail offering an additional 11,500 new places.

Yet, current programs need to be upgraded to ensure high quality and provision throughout the day. Therefore, all half-day places should be converted to full-day and additional resources allocated for all existing places both in 4K and CDEPP. (These enrollment figures exclude children in Head Start or those using childcare vouchers; if these children change to another program, we assume new children would take their places in Head Start or childcare).

This proposal is summarized in Table 1, which also includes information on the distribution of existing places. Under the new proposal, there would be 11,500 additional places offered to four-year old children. In addition, all 4K places (20,570) would be full-day and high quality, as would the CDEPP places (3,241). Enrollment numbers for 2008 show growth in CDEPP up to 4,305 places but the cohort size is almost identical. However, as we describe below, the key issue for this analysis is to describe the economic impacts of increasing enrollment, not the economic consequences of the current level of enrollment. Even as enrollments are growing this new scenario would create a large-scale, integrated system for the majority of children.

Table 1 — Current and proposed enrollments in pre-school in South Carolina

	Current programs	*Proposed new provision*
Cohort of four-year olds	**57,251**	**57,251**
Served by:		
Full-day 4K	11,108	20,570
Half-day 4K	9,462	0
CDEPP	3,241	3,241
Head Start	6,100	6,100
ABC Vouchers	3,500	3,500
New places	—	11,500
Total enrollment	**33,411**	**44,911**

Notes: Proposed new provision for 4K, CDEPP, and new places would be high quality. Enrollment does not include children in special education.
Sources: SC CEO (2008, 2007); NIEER (2006).

2.3 Funding for expansion and enhancement of pre-school

The proposed expansion of pre-school in South Carolina would require a substantial increase in public spending. High quality pre-school is not cheap and most states underfund pre-school and so do not offer the most effective programs.

A growing amount of research has focused on what high-quality pre-school costs, rather that what states actually spend on pre-school. Methods for calculating the cost of pre-school may be based on accounting templates, on model programs, and on cost function equations.[12] Alternatively, the cost of pre-school may be inferred from comparisons of spending patterns across the education system. One comparison—recommended by Barnett and Robin (2006)—is with current spending on first grade in South Carolina. The inputs needed for first grade and pre-school are similar, as are the pedagogies, and the teachers are often recruited from the same labor market. (Pre-school classes are often smaller than first grade but the days are also shorter). An alternative comparison is with Head Start: high quality pre-school programs offer many of the same services as Head Start and so equating their costs is plausible.[13]

These two spending comparisons yields an estimate of the cost of high quality pre-school considerably above the amount currently allocated to 4K or CDEPP. The average of the two comparisons is $7,600.[14] We apply this as our cost estimate. (Not only is it conservative to assume higher costs, but it builds in an allowance should average costs rise as enrollment expands).

Table 2 shows both current spending and proposed spending (excluding Head Start and the child care program). Current spending is $96.87 million. Proposed spending would be an increase of $87.40 million for the 11,500 new places plus $84.10 million for upgrades to the 4K and CDEPP. Total spending would therefore be $268.36 million annually, with an additional investment being $171.50 million. This amount is less than 6% of annual spending on K–12 education in South Carolina.

How to fund pre-school (such as the use of a Readiness Fund) is not addressed here. A range of sources are possible: some states have earmarked revenue streams; others have used federal funds (such as TANF or CCDF money).[15] It may be possible for South Carolina to draw on more than one funding source. Independent of the source of funding, however,

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12 Golin et al. (2003); Manship et al. (2007); Muenchow et al. (2005); Belfield (2006); Belfield and Schwartz (2007); Applewhite and Hirsch (2003); Brandon (2004); Barnett and Kelley (2002); Levin and Schwartz (2007); Yonce et al. (2006).

13 Total K–12 spending on first grade is $7,900 (ed.sc.gov; www.friedmanfoundation.org~ /friedman/downloadFile.do?id=69) and federal Head Start funding in South Carolina is $7,300 (www.acf.hhs.gov/~/hsb/about/fy2007.html).

14 A third comparison is to use the amount spent in other high poverty districts. For example, the New Jersey Abbott districts spend $9,100 (Belfield and Schwartz, 2007, adjusted for urbanicity/state using Taylor and Fowler, 2006); but this program is recognized as high quality (Frede et al., 2007).

15 Discussion of these issues is in Gilliam and Marchessault (2005); Greenberg and Schumacher (2003); and Scrivner and Wolfe (2003).

Table 2 — Current and proposed enrollments and costs in pre-school in South Carolina

	Enrollment	*Cost per child*	*Total cost (millions)*
		Current pre-school provision	
Served by:			
Full-day 4K	11,108	$5,300	$58.87
Half-day 4K	9,462	$2,650	$25.07
CDEPP	3,241	$3,986	$12.92
Total cost			**$96.87**
		Proposed expanded, upgraded pre-school provision	
Served by:			
Full-day 4K	20,570	$7,600	$156.33
Half-day 4K	0	—	—
CDEPP	3,241	$7,600	$24.63
New places	11,500	$7,600	$87.40
Total cost			**$268.36**

Notes: Proposed new provision for 4K, CDEPP, and new places would be high quality.
Sources: SC CEO (2007); NIEER (2006). Dollar amounts rounded to two decimal places. 2007 dollars.

this proposed policy would represent a substantial commitment by the state and significantly increase the numbers of four-year old children who can access pre-school. At issue is whether such an investment would make economic sense from the state perspective.

3. ECONOMIC BENEFITS OF PRE-SCHOOL FOR SOUTH CAROLINA

3.1 Enumerating the economic benefits

Prior research has identified many private, fiscal, and social benefits to a state from pre-school programs. These can be compared to the costs of the programs.

The basic framework is given in Box 1. The investment costs can be compared to the economic benefits. There are economic benefits for the child in the short run (more schooling, better health, increased well-being) and in the long run (a higher probability of going to college and the associated higher incomes). There are also benefits to society (e.g. if crime rates are lower).

Box 1 The Economic Model for Investments in Pre-school

Investment Costs [C]

High quality pre-school:

- Full day and full year
- Teachers with full credentials, professional development, and market pay rates
- Group sizes are small (<20)
- System is coherent (not blended)
- Centers are accredited
- State monitoring and regulations are enforced

Benefits/Cost-savings [B]

For child:

- Higher achievement; better health/nutrition; less abuse
- Higher likelihood of graduation/college enrollment; higher earnings; lower teen-pregnancy/delinquency

For society/economy:

- Income tax revenues from parents' released time
- Greater school system efficiency (reduction in special education, grade repetition, higher learning productivity); reduction in abuse/neglect; lower reliance on public healthcare
- Increased income tax revenues; lower welfare dependence; reductions in delinquency/crime (net of higher education subsidies)

Importantly, there are economic benefits to the state and so to the taxpayer. These benefits are the focus here:

1. *Efficiency gains to the school system:* Special education and grade retention rates are reduced, and, because students are better prepared, schools can provide education more efficiently. The state saves on education budgets.
2. *Increases in tax revenues:* Pre-school participants themselves become more productive as they enter the labor force, and during the pre-school period, childcare needs of families are met, reducing their expenses and allowing parents to work. The state gains from higher tax revenues.
3. *Budgetary savings in the criminal justice system:* By enhancing economic opportunities for children, pre-school programs play an important role in reducing crime, both while the children are juveniles and as they enter adulthood. The state gains because public expenditures on criminal justice and incarceration are reduced.
4. *Savings in health and welfare budgets:* By improving the economic conditions for children at an early age, pre-school can reduce public commitments in terms of health and public assistance payments. Thus, the state saves on expenditures for Medicaid and welfare.

Using this framework, specific fiscal benefits for South Carolina can be computed.[16] First, the impacts of the proposed pre-school program on each of the four categories are calculated. Importantly, the only economic benefits that are counted are those for the government or taxpayer, not those for the participants themselves. Then, the cost consequences of those impacts are assessed. For example, pre-school reduces special education by S% and the cost of special education is $Y; cost savings are therefore $(SY/100). State-specific data is used where available for both the impacts and the costs. All money values are expressed in present values so that they can be compared with the costs of the program.[17]

We might anticipate that the benefits of pre-school would exceed the costs. Several high-quality studies have calculated the economic return to early childhood education. Each study shows the total economic benefits which outweigh—by a considerable margin—the costs of the program. New evaluations of the High/Scope Perry Pre-School Program show that for every $1 investment, $12.90 was recouped in terms of benefits over the lifetime. For the Abecedarian Early Childhood Intervention, an economic evaluation indicates that for every $1 investment, between $2–$3.66 was recouped in terms of benefits over the entire period. For the Chicago Child-Parent Pre-School Center (CPC) Program, every $1 investment, $7.14 was recouped in benefits. Finally, costing exercises for a large-scale version of Head Start show benefits that exceed the costs; even short-term and medium-term benefits offset 40-60% of the total costs.[18]

The economic benefits from expanding South Carolina's program are unlikely to be as large as has been found for these model programs (although the Chicago CPC program was reasonably large scale). These were very intensive programs targeted to at-risk groups of children. The proposal here is for a much larger statewide program at lower cost. However, research recent has found that pre-school benefits all children, regardless of background.[19] Disadvantaged children do benefit the most, but all children benefit.

For South Carolina, a recent evaluation of children's achievement in 4K gives precise estimates of the academic gains. Based on a survey of 777 children from across the states, Lamy et al. (2005) apply a regression discontinuity design approach to identify the impact of pre-school. Pre-school significantly improves literacy skills at the start of kindergarten; the effect is equivalent to an additional four months of progress in vocabulary growth. Also, pre-school boosted print awareness scores by nearly 19 percentage points, a growth

16 This method has been applied to pre-school programs in other states, see Karoly and Bigelow (2005) and Belfield (2005).

17 'Present values' are values that are adjusted to account for the time period in which the benefits are incurred. For example, children who have attended pre-school earn more as adults, but this is not until at least 15 years after pre-school. Therefore, these higher earnings should be discounted, i.e. valued less because they occur so far in the future. We apply the conventional discount rate of 3.5% (Moore et al., 2003).

18 See respectively, Belfield et al. (2006); Masse and Barnett (2002); Reynolds et al. (2002), Currie (2001), and Ludwig and Miller (2006).

19 See Gormley (2007a). In fact, large-scale programs may yield extra benefits in terms of peer learning, as found in Georgia by Henry et al. (2003). However, this study takes a very conservative approach and does not include benefits for which there is no conclusive evidence.

rate almost twice as fast as the norm. Children in low-income families benefited even more. In effect sizes, the gains in receptive vocabulary were 0.35 and in print awareness 0.71. These gains are substantial and compare favorably with the gains found for other state-wide or large-scale programs.

Based on these academic gains, we extrapolate forward to predict the lifetime consequences for those children who attend high-quality pre-school. The extrapolations are based on the high-quality research trials listed above and the broad social science evidence that links early grade and elementary school test scores with future outcomes. Therefore we assume only conservative benefits (see below). However, we do note the high levels of disadvantage in South Carolina and the research evidence that the benefits for disadvantaged children are considerably above those for children from wealthier families, as well as the evidence of strong test score gains in South Carolina.[20]

The benefits of the policy flow from two changes to the pre-school system. The first change is that approximately 11,500 additional children will be newly enrolled in high-quality pre-school. The second change is the expansion and upgrading of existing places. An equivalent of 4,730 'new' places would be added by ensuring that children in half-day programs can attend full-day. Plus, another 19,080 children would be in upgraded provision (full-time equivalents from full-day and half-day 4K and CDEPP). The effects of upgraded provision will be weaker than for the new enrollees. We assume these effects are 42% as strong as those for the new enrollees (because they are receiving approximately 42% more additional resource).[21] The economic calculations for these two changes are reported separately.

Importantly, we are calculating net effects beyond what we estimate as the baseline level of provision. It is therefore not so critical that the baseline is specified very accurately. (Indeed, pre-school policies change frequently, so the idea of a stable baseline may be illusory).[22] What is important is that we calculate the additional benefits from additional spending to see whether the changes pass a cost-benefit test.

3.2 Calculating the economic benefits

Below we calculate the economic benefits of proposed policy in terms of efficiency gains to the school system, increased tax revenues, and lower government expenditures on crime, health, and welfare. For each benefit, we use a conservative approach. (This is especially conservative for the income gains, where we assume gains are only restricted to

20 This ratio is based on the results from the evaluation by Gormley (2007b). The test score gains are from Lamy et al. (2005).

21 There is new evidence that the benefits of full-day pre-school are not as great as the benefits for full-day (Robin et al., 2006). However, our assumption of proportionality is simply reasonable, rather than strongly evidence-based.

22 As noted above, we suspect that the appropriations for pre-school at $4,200 are far below what is needed and probably somewhat below what is actually being spent within districts.

those who were previously dropouts but who become graduates after pre-school). We base the impacts and costs on published studies and extant datasets, and we use state-level data where possible. With national data, we adjust for the relative price level in South Carolina. All money values are reported in 2007 dollars. Future money streams are discounted using the standard rate of 3.5%.

3.2.1 Efficiency gains to the education system

Investments in pre-school reduce rates of special education and grade retention and they also make children more proficient learners. Each of these efficiency gains is important for the public school system.[23]

The rate of special education in South Carolina is 15.6% (the national average is 13.2%). The proposed policy reduces the rate by 21% for the children in the new program and proportionately for those in upgraded programs.[24] For the 11,500 new enrollees, cost-savings would be $24.05 million.

Similarly, the state has a very high grade retention rate, at 16.3%.[25] This rate is predicted to fall by 25%. For the 11,500 new enrollees, this would mean 500 fewer students retained and the cost-saving would be $2.73 million.

In addition, pre-school raises the overall productivity of the education system. There are savings in budgets for teaching, for security, and for remedial programs.[26] First, teachers 'prefer' instructing less disruptive children; these teachers are less likely to be absent or quit and will accept lower wages (as do private school teachers). Second, better student behavior reduces spending on: security, policing, and custodial services as well as on programs for substance abuse, truancy, and absenteeism. Finally, districts offer remedial programs; these are less necessary if students are more proficient.

Based on the results for South Carolina from Lamy et al. (2005), the overall productivity gain is 14% for the new enrollees.[27] From this we calculate savings: in teacher wages[28];

23 We exclude consideration of private school students (approximately 11% of each age cohort). These students have much higher rates of graduation than public school students and the government resource effects are significantly smaller. Also, pre-school may cause some students to switch to private school, reducing the public funding necessary.

24 Research literature includes reduction of special education effects of between 6% and 48% (Reynolds et al., 2000; Barnett, 1996); the average effect is 21%, and the CDCP (2002) reports a representative estimate of 12%. We assume annual effects on special education through the K–12 years. Reynolds et al. (2002) find these persistent effects all the way to 8th grade.

25 nces.ed.gov/pubs/dp95/97473-5.asp; www.sckidscount.org.

26 Each impact has been found in large-scale national datasets (Belfield, 2005). In fact, these productivity gains are an understatement because they omit benefits to other school personnel (for a discussion, see Belfield and Schwartz, 2006).

27 This percentage gain is calculated as the average of the gains reported in Lamy et al. (2005).

28 Teacher job satisfaction would rise by 6 percentage points, equal to a 3% increase in salary. Average public school teacher salaries in South Carolina are $45,570 (adjusted to 2007 dollars from www.aft.org/salary/2004/download~ /2004AFTSalarySurvey.pdf). A 3% raise spread across all K–12 years of schooling yields present value cost-savings of $12.40 million.

teacher turnover[29]; teacher absenteeism[30]; from improved school safety[31]; and from lower costs of remediation.[32] These five impacts would yield cost-savings of $27.54 million.

Overall, the savings just to the education system are significant. For the new places, they total $54.32 million for an investment of $87.40 million. Therefore, for each additional dollar spent on pre-school the school system would reap approximately 60 cents back as a result of reduced resource requirements elsewhere.

3.2.2 Increases in tax revenues

Tax revenues go up with expanded early childhood education programs: families can more easily enter the labor market; and the pre-school participants themselves will enter adulthood as more productive workers. Both effects raise incomes, increasing tax payments proportionately.

With additional time saved on child care, each family is freed up to participate in the labor market. From studies examining the relationship between child care availability and working, families with a child newly enrolled in pre-school have earnings that are $962 higher over the year. With a tax rate of 30% the extra tax revenues amount to $3.87 million across the 11,500 children.

In later adulthood, pre-school participants will have higher earnings primarily because they have accumulated more education. Indeed, pre-school programs have very powerful effects on high school graduation rates, particularly for African American children. For the new pre-schoolers the dropout rate should fall by 25%; across 11,500 students with a dropout rate of at least 35%, this would mean 1,006 new high school graduates.[33]

Earnings data from the Current Population Survey show that—as they leave school—each new graduate will earn significantly more than a high school dropout over the lifetime. These are big differences and a substantial body of research has shown that they are causal and not simply correlations. Many investigations, including those by Rouse (2007) and Carneiro and Heckman (2003), have concluded that the observed differences in earnings across education levels are actually caused by the extra education. Economists have compared earnings of twins with different education levels, for example; they have also examined how changes in the law have forced people to accumulate more education. All these studies indicate more education leads to higher earnings.

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29 Teacher turnover is predicted to fall by 8%. Annually, 12% of public schools either leave the profession or change to a new school. This imposes costs on schools and the industry standard for the cost of turnover is 33% of one year's salary of the new hire (NCES Digest, 2004, Table 74; www.sbec.state.tx.us/SCECOnline/txbess/turnoverrpt.pdf). Reducing these costs by 14% generates a present value saving of $2.7 million over the K–12 span.

30 Teacher absenteeism is reduced by 10%. On average, school systems employ 1 substitute teacher for every 15 regular teachers. With a 10% reduction in substitute teaching, the school system would save $2.72 million.

31 School safety is estimated to rise by 14% and, based on spending on school safety of 6% of total budgets, yield a saving of $8.45 million.

32 All school districts allocate funds for remedial education. Given the improvement in academic achievement as a result of pre-school, it is expected that these funds would be released. The cost-saving is estimated at $110 per enrollee, with a total cost-saving of $1.27 million across 11,500 enrollees.

33 This reduction is actually a conservative estimate (see Barnett and Belfield, 2006).

Taking college progression into account and the relative price level in South Carolina the net earnings advantage is $213,480 (present value at age 4).[34] However, the taxpayer only benefits by the amount of this extra earnings which is taxed. Assuming a 30% tax rate, the tax gains per new high school graduate are $64,050.[35] In the aggregate, this is worth $64.43 million in tax revenues paid by the 1,006 new high school graduates.

3.3.3 Savings in Child Health and Welfare Expenditures

Pre-school increases children's health and well-being. Pre-school children are more likely to be screened for health conditions, to be immunized, and to receive improved nutrition. In a review by the Center for Disease Control and Prevention, the effect size impact for social risks after pre-schooling is -0.41; and health screening rates are higher by 44%.[36] Also, pre-school enhances emotional and mental health: a recent study for inner city children in Seattle finds long-term positive effects (e.g. on anxiety, social phobia, and family relationships); and the Chicago Child-Parent Centers program reduces maltreatment and increases overall welfare.[37] These effects are almost certainly conservative estimates of the total impact because they are only the childhood effects and assume that healthier childhood does not lead to healthier adulthood. These effects are particularly salient in light of changes to S-CHIP and recent research on investments in children and Medicaid payments.[38] Their importance is reinforced when we consider the statistics for South Carolina on infant mortality, low birth weight incidence, and poor child health status.

These impacts will affect reliance on welfare programs and health support services, especially cases of abuse/neglect.[39] Based on the Chicago CPC program impacts, and adjusted for spending in South Carolina, the cost-savings amount to $340 per enrollee in welfare programs, $370 in government-funded health programs, and $350 in abuse/neglect services.[40] Across 11,500 places, the cost-savings would amount to $12.26 million.

3.3.4 Savings to the criminal justice system

Pre-school helps reduce both juvenile and adult crime; it may be because of behavioral changes or it may simply be because higher incomes reduce the pressure to commit crime. This effect is particularly important for minority males. African American males are incarcerated at rates 6 to 8 times higher than those for whites; almost one-quarter of all African American male dropouts are incarcerated; and at least 60% will have been imprisoned before they are 35 years old.[41]

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34 Calculations based on earnings premiums reported in Belfield and Levin (2007) and accounting for subsidies for higher education.

35 We note that the largest proportion of this tax revenue goes to the federal government and not to the state government Treasury. We consider this state/federal split below. However, some of the federal government expenditure that accrues from South Carolina stays in the state (for example, to pay for military bases). Therefore, any additional federal government receipts primarily benefit South Carolina.

36 CDCP (2002); Smokowski et al. (2004).

37 Hawkins et al. (2005); Reynolds et al. (2004).

38 See for example www.brookings.edu/papers/2007/01childrenfamilies_isaacs.aspx.

39 Newacheck and Kim (2005).

40 CAFR Comptroller General report 2007 (www.cg.state.sc.us/).

41 Petit and Western (2004).

The crime savings are derived as the average from three separate measures.[42] The Chicago CPC program generates present value savings of $6,050 per participant in terms of juvenile and adult crimes averted. Using Census data, Lochner and Moretti (2004) estimate that each additional high school graduate yields present value cost-savings of $12,490. Finally, the Perry Pre-School program show considerable savings in crime costs: Belfield et al. (2006) report present value cost-savings of $49,070 per new high school graduate.[43] The average cost-saving across the three measures is $43.86 million across the new enrollees.

3.3.5 Total fiscal benefits

All the fiscal benefits are summarized in Table 3 for a single age cohort of four year olds. The first column (1) reports the economic benefits for the new 11,500 places. In total, the fiscal cost-savings are $178.73 million. There are three main sources of benefit: savings to the education system, additional tax revenues, and savings for the criminal justice system.

The second column (2) reports the savings from upgrading the existing 4K program and CDEPP, as well as expanding it to allow those children who currently participate for a half-day to participate for a full-day. These benefits are calculated as fractions of the benefits derived for each new enrollee (as per column (1)). The fractions are based on the proportion of additional spending for the upgrade and expansion. The total cost-savings for this component of the proposal is $146.95 million.

The total fiscal benefit from both components is $325.68 million for each cohort of four-year olds.

4. COST–BENEFIT ANALYSIS OF EXPANDED PRE-SCHOOL IN SOUTH CAROLINA

4.1 Cost-benefit ratios for expanded pre-school

To determine if expanded pre-school is a good investment for South Carolina, the costs and the benefits are compared. Critically, only the fiscal benefits to the state are being considered; benefits to individual children and their families are excluded (as are broader state-wide impacts and the employment effects of a vibrant pre-school sector of the economy). In this respect, the cost-benefit comparison allows us to determine the optimal amount of public funding of pre-school. But it is far short of an assessment based on the true benefits.

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42 Again, these are very conservative estimates, because they only include the costs to the state and not the costs to the victims of crime; they also do not fully capture the costs of juvenile crime. So, even though the Perry program was more expensive than proposed here, its crime saving estimates are an understatement of the true effects from that program.

43 The difference between Lochner and Moretti (2004) and Belfield et al. (2006) estimates may be in part because of the additional crimes measured in the latter study. The Reynolds et al. (2004) numbers are higher because they include juvenile crime (unlike the other two studies).

Table 3 — Fiscal cost-savings per cohort (Present values $ million)

	(1) New enrollees (11,500 children)	*(2) Upgraded programs*[a]	*(3) Total fiscal benefits =(1)+(2)*
Special education	$24.05	$20.00	$44.05
Grade retention	$2.73	$2.27	$5.00
Learning productivity gains	$27.54	$22.89	$50.43
Tax revenues families	$3.87	$1.59	$5.46
Tax revenues—new high school graduates	$64.43	$53.56	$117.99
Criminal justice savings	$43.86	$36.46	$80.32
Health and welfare savings	$12.26	$10.19	$22.45
Total cost-savings	**$178.73**	**$146.95**	**$325.68**

Notes: Present Value (PV) figures are discounted over the K–12 and adult years at a rate of 3.5%. Dollar amounts rounded to two decimal places. Learning productivity gains are: higher teacher satisfaction wage effects; lower teacher turnover; improved school safety; and reduced pressure for remedial education. Economic values are in 2007 dollars. [a]Upgraded programs include full-day 4K with more resources, half-day 4K extended to full-day and with more resources, and CDEPP with more resources.

Using the figures in Tables 2 and 3, it is clear that the fiscal benefits of pre-school far exceed the investment costs. The comparison is given in Table 4. With benefits of $325.68 million and investment costs of $171.50 million, the pre-school program would yield net savings of $154.18 million. For every $1 invested in pre-school the state would recoup $1.90 in benefits. Based upon these calculations, pre-school expansion would be a strong investment, yielding high returns for South Carolina.

Both components of the proposal generate strong benefits. Children who newly enroll yield more benefits than children who receive upgraded programs. Each new enrollee in a high-quality, full-day program costing $7,600 would generate fiscal benefits 2.04 times as large. Upgrades and longer days would also yield strong benefits.

Multiple state agencies would share the fiscal benefits. For the South Carolina Department of Education, the investment in pre-school would not pay for itself, but every dollar invested would be offset by significant savings elsewhere in the school system. The Department of the Treasury and the Department of Corrections would also gain significantly from the investment. Importantly, some of the benefits would accrue to federal agencies and not just state agencies: income tax revenues are paid primarily to the federal government, which also funds some criminal justice and health services. Based on separate analyses for other states, we estimate that the federal savings are greater than the savings to state Treasuries, perhaps by a magnitude of 50%.

Table 4 — Costs and benefits of expanded pre-school per cohort (Present values $ million)

	(1) New enrollees	*(2) Upgraded programs* [a]	*(3) Total fiscal benefits =(1)+(2)*
Investment costs	$87.40	$84.10	$171.50
Benefits	$178.73	$146.95	$325.68
Benefits—Costs	$91.33	$62.85	$154.18
Benefits/Costs	2.04	1.79	1.90

Notes: See Tables 2 and 3. Economic values are in 2007 dollars. [a]Upgraded programs include full-day 4K with more resources, half-day 4K extended to full-day and with more resources, and CDEPP with more resources.

Further sensitivity testing indicates that the overall conclusion is robust. Most likely these benefit-cost ratios understate the true gains because the cost estimates are higher than current provision and the benefits exclude any benefits to students who would have graduated from high school without the pre-school program. Also, these results correspond with those from an independent study produced for the state of California as well as similar studies done for Ohio and Massachusetts.[44]

4.2 County-specific economic returns

Research shows that the benefits of pre-school are stronger for disadvantaged minority children. Therefore, some counties—those with high proportions of minority children and poor families—are likely to benefit most. These groups are most at-risk of being on welfare, of involvement in the criminal justice system, or of relying on Medicaid for their health care needs. By offsetting these risks, pre-school generates benefits for the local county.

Hence, it is possible to identify counties where the economic benefits of pre-school will be especially strong. The focus is on five counties: Clarendon, Florence, Lee, Orangeburg, and Sumter. These counties are compared to Greenville and Spartanburg. These two counties have somewhat more prosperous economic conditions (e.g. with higher foreign direct investment, higher levels of human capital, and high incomes). But these counties have some disadvantaged areas as well. Basic economic statistics from the Census are reported in the first columns of Table 5.

For several reasons, these five counties are likely to benefit more than the average county across the state from pre-school. First, these counties are 'majority-minority' populations and the benefits from pre-school are found to be approximately 1.6 times greater for

44 Karoly and Bigelow (2005); Belfield (2005).

Table 5 — Pre-school in selected counties in South Carolina

	Median household income	*% with BA degree (aged 25+)*	*% in poverty*	*% FTE 4K*	*CDEPP places*	*Benefit-cost ratio*	*Total cost savings (million)*
Lee	$26,700	9%	97%	28%	Yes	3.99	$3.3
Orangeburg	$30,000	16%	85%	38%	Yes	3.63	$13.1
Clarendon	$27,500	11%	84%	38%	Yes	3.52	$4.7
Sumter	$33,900	16%	75%	25%	No	3.22	$13.3
Florence	$35,800	19%	72%	31%	Yes	3.09	$16.1
Greenville	$42,400	26%	53%	22%	No	2.40	$3.9
Spartanburg	$27,500	18%	60%	29%	No	2.67	$28.7

Source: Census (2004); SC EOC (2007, Appendix D Table 1), columns 1–3.

minority, disadvantaged children (Gormley, 2007a). Second, a comparison of the percent of children in poverty with existing pe-school places shows significant scope for expansion. Table 5 shows the percentage of children in poverty greatly exceeds that number of full-time equivalent 4K places (and not all these counties participate in CDEPP). With the exception of Greenville and some districts in Spartanburg, these counties all rank very high on poverty index and Lee county has the highest rate of poverty across the state (SC EOC, 2007; SC EOC, 2008). Third, despite infrastructure connections to major towns, these counties have been identified as 'economically underperforming' without a strong labor market. A key to economic growth is therefore raising the skills levels of workers.

We can adjust the baseline benefit–cost ratio to account for the relative scarcity of pre-school and the high rates of poverty. These adjustments show that the economic benefits of pre-school are significantly higher for counties with these characteristics. Relative to the state-level average of $1.90 for every $1 invested, these counties would likely reap benefits of at least $2.40 (Greenville) up to $3.99 (Lee). These higher ratios arise from two factors: high-quality pre-school is more urgently needed; and the benefits of such pre-school will be greater. The final column of Table 5 shows the total cost savings for each county. This total reflects the populations in each county, as well as the level of poverty (and so the net gains from preschool). Each county benefits significantly, ranging from $3 million to $29 million.

4.3 Education and Economic Development

There is widespread consensus among economists that improvements in education levels can help economic development. These improvements need not happen just through investments in pre-school, although this is where the evidence shows the strongest returns (Carneiro and Heckman, 2003). One important indicator of how education drives economic

development is the rate of high school graduation. In 2002, South Carolina's high school graduation rate was 48%–57%, which is one of the lowest across the U.S.[45]

Through the Education and Economic Development Act (EEDA) of 2005, South Carolina has committed to raising the high school graduation rate. The EEDA includes programs to better identify at-risk students, to set up individual graduation plans (Pathways to Success), to raise the standards of high school course work, and to align the requirements for high school graduation and college. Aligning college and high school systems should encourage students to take more efficient pathways to graduation and motivate them to progress on to higher education.

As shown above, pre-school helps raise the high school graduation rate. Using data from the Chicago Child-Parent Center programs, a high-quality pre-school program is likely to raise the high school graduation rate by 11 percentage points (Reynolds et al., 2002). This is similar to the average figure used above, of a fall of one-quarter in the overall dropout rate. Thus, from a base of approximately 60% the graduate rate would rise to approximately 70%. For each cohort of approximately 60,000 persons aged 18, there would be 6,000–6,600 new high school graduates. This annual increase would significantly raise economic growth.

The economic consequences of graduating from high school over dropping out are huge (see Belfield and Levin, 2007). For example, a 20-year old African American male who is a high school graduate will earn over $300,000 more than a high school dropout. If he goes on to complete college, the difference rises to $1,100,000. (These figures are present values, i.e. amounts at age 20). These extra earnings reflect what businesses see as a more productive worker and so are directly addressing the most important need of business (productive employees). As well, this individual will pay more taxes, rely less on welfare and government health programs, and be less likely to be involved in the criminal justice system. From the perspective of the taxpayer, these effects are worth $269,000 (present value aged 20). The effects and the amounts are quite similar, regardless of race, ethnicity, or gender.

These are national figures, but the same relationships hold for South Carolina. In fact, because of its relatively low education levels, the state is particularly influenced by educational disparities. State data clearly illustrate this.[46] The earnings benefits of education are at least as strong as for the rest of the nation. One-third of all unemployed young adults are dropouts. One-third of all single mothers are dropouts. Half of all TANF recipients are dropouts. Three-quarters of prison inmates are dropouts. This last statistic is especially salient, as South Carolina ranks as the fifth highest in the nation for incarceration rates.

45 The year 2002 is the most recent with comparable state data (see Seastrom et al. 2006).
46 www.scyoungadults.org/sc_educ.asp

Table 6 — The economic benefits of high school graduation over dropping out in South Carolina

	Per new high school graduate over dropping out (Present values over the lifetime)
Individual benefits: Extra earnings	$345,560
Taxpayer benefits: Higher tax revenues and lower government spending on health, crime and welfare	$213,450

Notes: Figures adjusted for South Carolina prices and wages from Belfield and Levin (2007).

Therefore, it is possible to calculate the economic impact of a set of programs—reflected in the EEDA—that might help students graduate from high school. See Table 6. Adjusting for the relative price level in South Carolina, the earnings gained per marginal high school graduate would be $346,000. This is a present value at age 18 of the lifetime earnings gains attributable to the extra years of schooling associated with high school graduation. For the taxpayer, the economic gains would be worth $213,000 (from higher tax revenues and lower spending in adulthood on health, crime, and welfare). Again, this is a present value amount at age 18. It may be thought of as equivalent to the amount of extra money in a certificate of deposit.

For society, the benefits are even larger. These social benefits include not only the individual earnings gains and the taxpayer benefits but they should also include a wider array of benefits. This wider array will include greater economic competitiveness from having a more educated workforce, a healthier community, and a community where crime is less prevalent. Calculations of these social benefits are much less precise than for the individual and taxpayer benefits, but they have been found to be at least the same size as the earnings gains (in this case, $346,000).

These economic values do not account for the costs of implementing the EEDA. However, this cost is certainly far below the benefits when expressed per student. These economic values do not account for the fact that not all individuals who receive EEDA supports (such as individual learning plans) will actually graduate. Nevertheless, there is a significant margin between the returns and the costs. This simple calculation therefore suggests that, if the EEDA implements effective strategies to raise the high school graduation rate, these strategies would almost certainly pay for themselves.

5. CONCLUSION

Pre-school is a good investment for children. Research shows that high-quality pre-school helps children's cognitive growth and enhances their future prospects. The effects are especially strong for minority children from disadvantaged circumstances.

This economic analysis has calculated the cost and benefits of expanding and upgrading pre-school for four year olds across South Carolina. These calculations are derived using simple investment appraisal tools to determine whether the stream of benefits outweighs the initial cost. Under all reasonable scenarios, the economic benefits of pre-school exceed the costs.

Current spending on pre-school in South Carolina is $97 million. A high quality program to cover all at-risk four-year old children in the state would cost an additional $172 million annually. This would provide 11,500 new places and upgrade existing provision. The benefits of this pre-school investment to taxpayers—in the form of higher government revenues and lower spending—would be substantial. Conservatively, these benefits would total $326 million.

Therefore, the benefits exceed the costs by $154 million. For every $1 invested, the taxpayer gains $1.90 in benefits. This economic calculation suggests that expanding pre-school options would make very good sense for the state.

In part, pre-school is beneficial because it promotes school readiness and raises the probability of graduating from high school. On average, high school graduation significantly improves economic well-being. This is the motivation for the Education and Economic Development Act (EEDA) of 2005 and its Pathways to Success in high school and college.

If the EEDA programs raise the graduation rate they will generate a very high return for the state. Recent calculations (adjusted for South Carolina prices) show that each new high school graduate earns $346,000 more than a dropout over the lifetime. For the state's taxpayers, the economic gains per new high school graduate are $213,000. These amounts easily exceed the per-student costs of implementing the EEDA.

Of course, pre-school is not a panacea. It cannot fully compensate for disadvantage in the infant years and it may be undermined by inadequate education in elementary and secondary school. Some pre-schools will not be as effective as they could be and government oversight is necessary to make sure that all centers are held accountable for providing high-quality programs. Nevertheless, the academic and behavioral advantages of pre-school are sufficiently large that it represents a solid foundation on which to improve the futures for many young children.

This foundation is particularly important for minority and disadvantaged children: these are the children most at-risk of special education, grade retention, and low academic test

scores. Later on, this exposes them to a greater risk of high school failure with dropout rates perhaps 10–20 percentage points higher than for white children. In adulthood, lower economic well-being for minority groups leads to higher rates of crime and welfare dependency and more constrained economic opportunities. Both for these children as individuals, as well as for taxpayers in South Carolina, high quality pre-school is a worthwhile investment.

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